

NATURE CONSERVATION IN LINCOLNSHIRE

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A Wold landscape near the Bluestone Heath Road. (Photo by F. H. Clift).

Cover design by Wally Day

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being the

PRESIDENTIAL ADDRESS

Delivered at Lincoln on 22nd March, 1969

by

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(formerly Hon. General Secretary, 1948-1969)

President, Lincolnshire Naturalists' Union, 1968-69



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LINCOLN

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Foreword

In February, 1943 the Lincolnshire Naturalists' Union formed the Lincolnshire Nature Reserves Investigation Sub-Committee; a member of it was Mr. A. E. Smith. Three years later he was appointed Hon. Secretary/Treasurer of The Nature Reserves and Wild Life Conservation Committee of the Union. In December, 1948 the articles of the Lincolnshire Naturalists' Trust were signed with Ted Smith as the Honorary General Secretary, a position which he held until this year. For the last 26 years, therefore, he had been the chief agent in the conservation of nature in Lincolnshire, as well as his national activities in this field through the Society for the Promotion of Nature Reserves in recent years. All this has been done voluntarily outside his job as the University of Nottingham's Resident Tutor in Lindsey.

Mr. Smith's interests cover a wide range of natural history specialisms; he was co-author with the late R. K. Cornwallis of *The Birds of Lincolnshire*, published by the Union in 1955. Although he has contributed other papers on the conservation of nature and is of national standing as a conservationist, this is the first published comprehensive analysis of nature conservation in Lincolnshire. One of its great values is its implications for other counties. Thus the Lincolnshire Naturalists' Union is happy to make such a masterly address available to a wider readership. Also it is particularly appropriate that it should be published as the Trust approaches its 21st year.

General Editor:

D. N. ROBINSON, M.SC.

Printed by

KEYWORTH & FRY LTD., 117-121 PORTLAND STREET
LINCOLN

The Background

Conservation — a word increasingly used and often imperfectly understood — has been succinctly defined in our context as the wise use of those resources which constitute the major elements of our natural environment: air, land, water and wildlife. It is the increasing pressure on the environment of human populations and human activity that has made conservation a fundamental and an urgent problem. Man's misuse of natural resources is nothing new; many of the great civilisations of the past were ruined as a consequence of it. But there are trends and forces in our time which make conservation an issue of survival for the whole of mankind.

One has to begin with the explosive growth of human population throughout the world; if current trends continue the present 3,500 millions will double by the end of the century. Can the production of food and the supply of raw materials keep pace with this phenomenal growth of population? And what of the effects on the environment of modern technology which has to be applied in industry and in agriculture to satisfy the demands not only of more people, but of the higher material standards of living to which they aspire? Mounting with modern urban development: factories, motorways, airfields and, so often unfortunately, dereliction and pollution of air and rivers and seas. The effects of cities are felt in the countryside far beyond their immediate sprawling boundaries, especially in those countries where affluence has given a new meaning to leisure and where the motor car has made an anachronism of distance and remoteness. I must narrow my theme, but it is always in this broad context that I have to pursue it.

In this, the second most densely populated country of Europe, we are acutely aware of the problems of eking out the land and the water and the other resources to support our growing numbers and our high material standards. New towns are created and old ones extended; industries expand often into rural areas; power stations and oil refineries are built on almost every major estuary; the disposal of human and industrial waste poses major problems; increasing hordes of vehicles crowd our roads — 16 million now, 25 million in 1980, 35 million by 2010; and people flock in vast numbers to coast and country in search of pleasure and recreation. And in the countryside itself the revolution in agriculture is leading to radical changes in the landscapes of much of lowland England.

Whilst Lincolnshire remains for the most part a rural county with a relatively sparse population, the winds of change are blowing strongly over the marshland pastures beside the Humber, and at the other end of the county the new Peterborough, destined to become a city of more than $\frac{1}{4}$ million people, will make its presence felt in the countryside of south Kesteven. Before the permanent population of Lincolnshire began to grow, largely as a result of Humberside developments, the main human pressures had been on the Lindsey coastline, long stretches of which had been developed for the use of the seaside holidaymaker. It is the recent agricultural changes, however, which have so far had the greatest impact on the Lincolnshire countryside. The new materials and techniques which the chemist has put into the hands of the farmer have enabled him to dispense with the rotational systems which had dominated English agriculture for 200 years, and to concentrate on arable cropping. The results of this are the drastic reduction in permanent grassland, the drainage of wet places, the removal of hedges — in general, more intensive cultivation and the gradual disappearance of the Enclosure landscape which had produced, incidentally, a wealth and variety of wildlife unsurpassed in any other man-

made countryside. Large areas of Lincolnshire are now hedgeless and treeless arable prairies, and wild places, already severely reduced by the earlier agricultural changes of the 18th century, have been reduced to fragments.

Realisation that these developments made conservation urgently necessary in this county was the main reason why the Lincolnshire Trust was one of the earliest county trusts to be established. Only Norfolk (1925) and Yorkshire (1946) preceded its formation in 1948. It sprang from the Nature Reserves and Wildlife Conservation Committee of the Lincolnshire Naturalists' Union which in turn had its origins in the County sub-committee of the Nature Reserves Investigation Committee, the body which laid the foundations nationally for many later developments in conservation including the establishment of the Nature Conservancy.

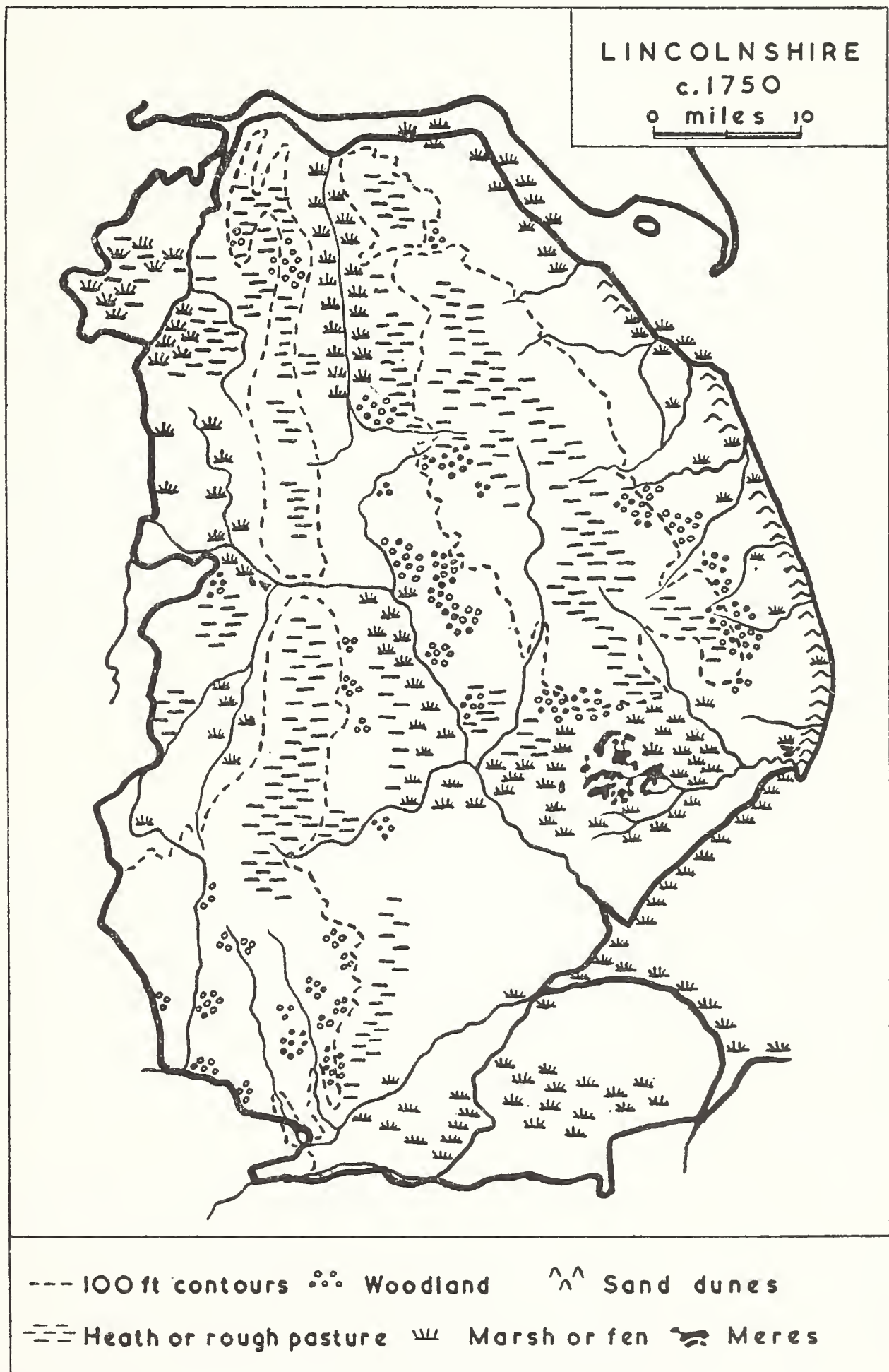
The Trust, like all similar bodies — and there are now 37 Trusts covering virtually the whole of the U.K. — has sought to promote and practice conservation in several ways, but principally by the creation and management of nature reserves; by measures designed to ensure the maximum variety of habitat and wildlife in the countryside as a whole, and by promoting education at all ages and at all levels. Of all these media it is perhaps education that is of paramount importance, but in this address I propose to concentrate on the habitats and landscapes of Lincolnshire and on the problems of their conservation.

The Structure and Scenery of Lincolnshire

The solid geology of Lincolnshire is simple, consisting almost entirely of the Jurassic and Cretaceous rocks which dip regularly eastward. The successive strata outcrop in regular and continuous belts roughly from north to south, while the main physical features present a correspondingly simple and regular arrangement, the limestone and the chalk rocks standing out as highlands with westward facing scarps, the clays underlying the lowlands and valleys. Of the highlands the Lincolnshire limestone presents an almost continuous line of escarpment — the Cliff — from south to north along the western side of the county, broken only by the gaps at Lincoln and Ancaster. In the north the limestone ridge is narrow; in the south it broadens into a gently sloping plateau — the Heath — intersected by the valleys of the Witham and the Glen. The chalk Wolds form a broad upland area mostly between 200 ft. to 500 ft. high, some 45 miles long and 6 to 12 miles wide, running south-eastwards from the Humber to the vicinity of Burgh-le-Marsh. The northern Wolds form a rolling plateau with comparatively few streams or valleys; but further south there are more valleys, running east and south-east; and in the south-west the chalk has been removed to expose the lower Cretaceous rocks and the Kimmeridge Clay. Of the lowlands, the clays west of the limestone ridge are mainly Lias; to the east they consist mainly of Oxford and Kimmeridge in the Upper Jurassic.

But much of the solid rock of Lincolnshire is overlain by glacial deposits — boulder clay and sands and gravels. There is a good deal of this drift material over the Jurassic rocks of southern Kesteven, over a large area of the central lowlands and on the eastern side of the Wolds on the wave-cut platform in the chalk which we know as the Marshland. Boulder clays, on the surface of the Middle Marsh, also underlie the later silts and clays of the Outmarsh, and the silts and peats of the Fenland which occupies the whole of S.E. Lincolnshire. There are deposits of sands and gravels in many of the Wold valleys, but the most extensive are: (1) those in the north-west, the cover sands, which overlie the Jurassic clays and even the oolite ridge in places from the vicinity

of Market Rasen to the Isle of Axholme, (2) those to the west and south-west of Lincoln, (3) the deposits along the edge of the former fenland lake in the region of Woodhall Spa and (4) those carried by overflow waters through the Ancaster Gap. It will be seen that the Ice Age played a most important part not only in shaping the present surface features of the county, but in determining its soils and consequently its natural vegetation.



Man and the Land

It is quite impossible to reconstruct the appearance of Lincolnshire before the first farmers of the New Stone Age began the long process of destroying the wilderness and converting the land and its resources to human use. But except perhaps on the lighter soils which were more intensively used by prehistoric peoples, I have no doubt that much of the original forest and other natural habitat survived until Roman times. It was the Anglian and Danish settlers with their more widespread pattern of permanent settlements and their cultivation of the claylands — largely avoided by prehistoric peoples — who slowly but steadily reduced the forest and began to drain the fens and marshes. By the 17th century most of the woodland had gone and what remained was probably little more than scrub, the best trees having been consistently taken for timber and regeneration largely thwarted by pigs and other grazing animals. But there were still vast areas of heath and down and fen, used by man, of course, but with great variety of habitat and wildlife. Until the first half of the 18th century in fact Lincolnshire was still a half wild county, remote and sparsely populated. Within a 100 years — by 1830 — it had become the most intensively cultivated county in England. Of all the semi-natural habitats other than woodland, only the acid heathlands escaped, but their turn came later in the 20th century with afforestation and with the new agricultural revolution which is again changing the man-made landscapes of the county.

There is no habitat in Lincolnshire which can truly be described as natural unless it be the sandy and muddy foreshores of the coast. Even those are affected to some extent by man's activities — by pollution, by coastal defence works and so on. And certainly the processes of accretion and erosion which affect the sand-dunes and saltmarshes are influenced by man's use of the coastline. But here, and in many places inland, the existing plant covering and most of its associated animals have not been planted or put there by man; they have survived in or colonised habitats which man has modified to a greater or lesser extent. These we can justifiably call semi-natural.

Woodlands

Let us take first the woodlands. We have none of those near-natural fragments of forest like the ashwoods of the Derbyshire Dales, the oakwoods of Killarney or the pine forests of Rothiemurcus. Our deciduous woods are less natural than that, although many of them still consist almost entirely of native trees. Recent coniferous afforestation apart, Lincolnshire is a very sparsely wooded county. According to the 1924 forestry census only 2.4% of its surface was woodland and of that a quarter was classed as scrub, felled or devastated, or uneconomic. The extensive Forestry Commission plantations on the sand and gravel areas in the last 40 years have raised the proportion of woodland, but it is still less than 3%.

Our older deciduous woodlands are mainly on clay soils. There are the boulder clay woods of the Middle Marsh exemplified by the Trust's Hoplands Wood reserve. Like Hoplands most of these woods have been managed on a coppice-with-standards system, coppice of Ash or Hazel and a variety of other native shrubs, and standards of Oak or Ash. Almost everywhere now this type of management is being abandoned and the woods are being converted into mixed conifer-deciduous or pure conifer crops. In order to perpetuate the variety of flora and fauna of the coppice-with-standard woodlands the Trust intends to manage about half of Hoplands on that system; the remainder will be high forest.

The most extensive of the county's woodlands are those in the central clay vale between Market Rasen and Bardney. Here too many of the woods have been felled in recent years and replanted with conifers. In the older semi-natural woods Pedunculate Oak is usually the dominant, but frequently co-dominant is Ash and small-leaved Lime, a native tree now localised in Britain on calcareous soils. It is of course the Linden tree of Linwood and incidentally it was also called Bass, hence Bass Wood near Wragby. Some of these woods are high forest with Oak, Ash and Lime standards; others have Lime and Hazel coppice under an Oak canopy. Most have a rich ground flora which differs significantly in some of its elements from both the Middle Marsh woods and those of Kesteven.

In addition to their vegetation interest these woods have long been famous for their insect fauna, notably for butterflies like the Chequered Skipper, White Admiral, fritillaries and hairstreaks. They were also incidentally the last stronghold in Lincolnshire of four predatory animals which disappeared from the county in the latter part of the 19th century, the result no doubt of long persecution and disturbance: Kite and Buzzard, Polecat and Pine Marten.

The Oak-Lime association is now thought to be better represented in Lincolnshire than anywhere else, and negotiations are proceeding between the Nature Conservancy and the Forestry Commission for the establishment of a national forest reserve to include both high forest and coppice-with-standard types. The Trust has been closely involved in these negotiations and aims also to acquire an area of this woodland when an opportunity occurs.

Finally, there are the woods on the boulder clay and limestone soils of Kesteven. These are mainly Oak-Ashwoods less well known to naturalists than those of the other groups. Many of these also have been replanted with conifers, but some deciduous woods remain and deserve more investigation.

In general, our woodland plants, including some of the rarer ones, have survived well in the remaining deciduous woods, but with the increasing conversion to conifers and the disappearance or neglect of coppice many of them, especially those in the vernal phase, will inevitably become less abundant than formerly. Woodland bird populations are also well maintained. Even dense coniferous woods in their early stages provide a favourable bird habitat, although in later phases they are less well populated. I suspect, however, that the shortage of older trees — the result of heavy felling in recent years — may be partly responsible for the apparent decrease in all three species of woodpecker. Most seriously affected by woodland changes is the insect fauna. The decrease, and in some cases the disappearance of woodland butterflies like the fritillaries, is no doubt due to a variety of causes; but one of them must surely be the extensive felling of recent years, the disturbance which this has caused the spread of Bramble and the consequent shortage of food plants — Dog Violets, for example in the case of the fritillaries.

Another factor — and this may also be affecting some bird species — is the virtual elimination of the woodland edge habitat. Naturally, a woodland always develops a skirt, an area into which it is constantly trying to spread. Many woodland animals, butterflies in particular, live in edge habitats of this kind. The old 'greasy fields' — named after the Marsh or Greasy Fritillary butterfly — were just such places — damp meadows on the edges of woods, rich in flowers and insects. Not one of those referred to in the early *Transactions* of the Union now remains. Today there is an abrupt and quite unnatural transition, usually from arable to woodland. Edge conditions are, of course, reproduced in rides and glades and the importance of these cannot be overstressed. At Hoplands Wood, one of the Trust's first management tasks was to widen the main ride and encourage the growth of herbaceous plants. The

Trust has had discussions with the Forestry Commission about glade treatment and management, and at Skellingthorpe Wood the Commission left a margin of deciduous trees and shrubs along the main ride. I hope that more of this will be done especially where the remainder of the wood is being converted to conifers.

More natural perhaps than some of the closely managed woodlands just described are the Alder carrs found in some of the valleys of the southern Wolds where the streams have cut down through the Spilsby Sandstone to the underlying Kimmeridge Clay to produce steep-sided, narrow valleys. The dry upper slopes on the sandstone usually have a woodland cover of Beech, Ash or Sycamore and are carpeted with Bluebells. Badger setts are frequent in the soft rock. Below the spring line the valley floors on the clay are waterlogged and show a succession from streamside swamp communities to Alder and Willow carr under which Kingcups, Golden Saxifrages — including occasionally the rare Alternate-leaved species — and liverworts and mosses carpet the ground in spring. Although the Alders are occasionally coppiced, some of these carrs remain relatively undisturbed. Others have been cleared and replanted with Poplars or conifers. The conservation of one or more of the best examples is an urgent priority.

Birch forms woodlands on sands and gravels in the north-west and in the Woodhall area. It is usually in association with Oak and/or with Scots Pine which may be derived from introduced specimens. Most of our north-west reserves and Kirkby Moor have woodland of this type in succession from open heath. Friskney Decoy Wood on fen edge peat, although consisting partly of planted exotics, contains a considerable area of Birch, Scots Pine and Rowan. It seems likely that woodland of this type occurred round the fen edge before drainage.

Grasslands : General

Semi-natural grasslands are divided into two groups in the agricultural classification: rough grazings and permanent grass, but the distinction is largely one of intensity of management. Some have probably never been deliberately sown; others may have been sown originally, but consist almost entirely of native grasses and herbs which vary widely according to the nature of the soil, its water content, the intensity of grazing or mowing, and the amount of manuring.

Blackwood has shown in a recent article how the variation in the amount of permanent grassland in Lincolnshire in the last 100 years reflects the changing fortunes and practices of agriculture. In 1866 when official statistics first started, 28% of the acreage of the county was under permanent grass. This was the peak period of Victorian high farming with its emphasis on intensive arable — mainly cereal — cropping. Matthew Arnold, writing of the countryside around Oxford at that time in his poem *Thyrsis*, might equally have been writing about Lincolnshire or indeed about the present day:

“I know these slopes; who knows them if not I?—
 But many a dingle on the loved hill-side,
 With thorns once studded, old, white-blossom'd trees,
 Where thick the cowslips grew, and far descried
 High tower'd the spikes of purple orchises,
 Hath since our day put by
 The coronals of that forgotten time;
 Down each green bank hath gone the plough-boy's team,
 And only in the hidden brookside gleam
 Primroses, orphans of the flowery prime.”

From 1875 onwards, as agriculture sank into depression, the percentage of permanent grass rose steadily against the proportion of arable: 31% in 1885, 33% in 1905, 35% in 1915; a brief falling-back towards the end of the First World War, and then a further rise to 37% in 1935. The Second World War and the Agriculture Act of 1947 gave a new incentive to British farming reflected in rising arable and falling grassland acreages. By 1945 the latter was only 25%, lower than at any time since 1866. By 1955 it was down to 23%, by 1965 to 17% and by 1966 to 16%. Concentration on arable production in recent years has, of course, also been encouraged by the use of chemicals as fertilisers and herbicides.

The full effects on wildlife in Lincolnshire of the disappearance of permanent grassland, including parkland, are impossible to assess, but they have undoubtedly been far-reaching. We must remember, of course, that many of the places known for their variety of plants and animals before the last war — rough grass and scrub-land like that along Mareham Lane, south of Sleaford, and some of the woodland edges to which I have referred — were the result of agricultural depression and neglect. We can echo Arnold's lament — we can go back another forty years before Arnold and listen to John Clare, the Northamptonshire peasant-poet, describing the ragged heaths of his native Helpston:

“Swamps of wild rush-beds and sloughs’ squashy traces,
Grounds of rough fallows with thistle and weed,
Flats and low vallies of kingcups and daisies,
Sweetest of subjects are ye for my reed:
Ye commons left free in the rude rags of nature,
Ye brown heaths beclothed in furze as ye be,
My wild eye in rapture adores every feature,
Ye are dear as this heart in my bosom to me.”

and regretting the changes which enclosure and improvement had brought to them:

“Ye injur’d fields, ye once were gay,
When Nature’s hand displayed
Long waving rows of willows grey
And clumps of hawthorn shade;
But now, alas! your hawthorn bowers
All desolate we see!
The spoiler’s axe their shade devours,
And cuts down every tree.
Not trees alone have owned their force,
Whole woods beneath them bowed,
They turned the winding rivulet’s course,
And all thy pastures plough’d.”

How modern it all sounds! And what a graphic reminder that all the time in lowland England we are dealing with man-made landscapes, changes in which have in turn caused changes in the status and distribution of many plants and animals.

It has been said of course that the present trend towards larger fields and fewer hedges is merely a return to a pre- enclosure type of landscape. This I do not accept. It is true that the open fields were very large, but part was always fallow and no doubt very weedy as Clare indicated; and they were surrounded by plenty of rough grassland, scrub and woodland of a nature and extent that does not exist today. Besides, pre-enclosure or even mid-nineteenth

century farming in its years of greatest arable production did not have the machinery and the chemical weapons which now enable farmers to cultivate the land more intensively and more thoroughly than ever before.

Grasslands : Meadow and Pasture

Today in this county we must anticipate the almost total loss of permanent grass and of those rough, uncultivated patches and undrained places which went with less intensive systems of farming. Already a field full of Cowslips has become an unusual sight and some of the rarer associated plants of neutral grasslands have suffered a drastic decline. The Green-Winged Orchid is a good indicator. Ball in 1965 surveyed 30 sites where this attractive plant had been recorded in the previous thirty years. He found that almost half of them had been converted to arable or reseeded; in the remainder orchids could be found in only five. Several more of these fields have since been ploughed. Thus a plant relatively widespread 20 years ago has been reduced to the status of a rarity.

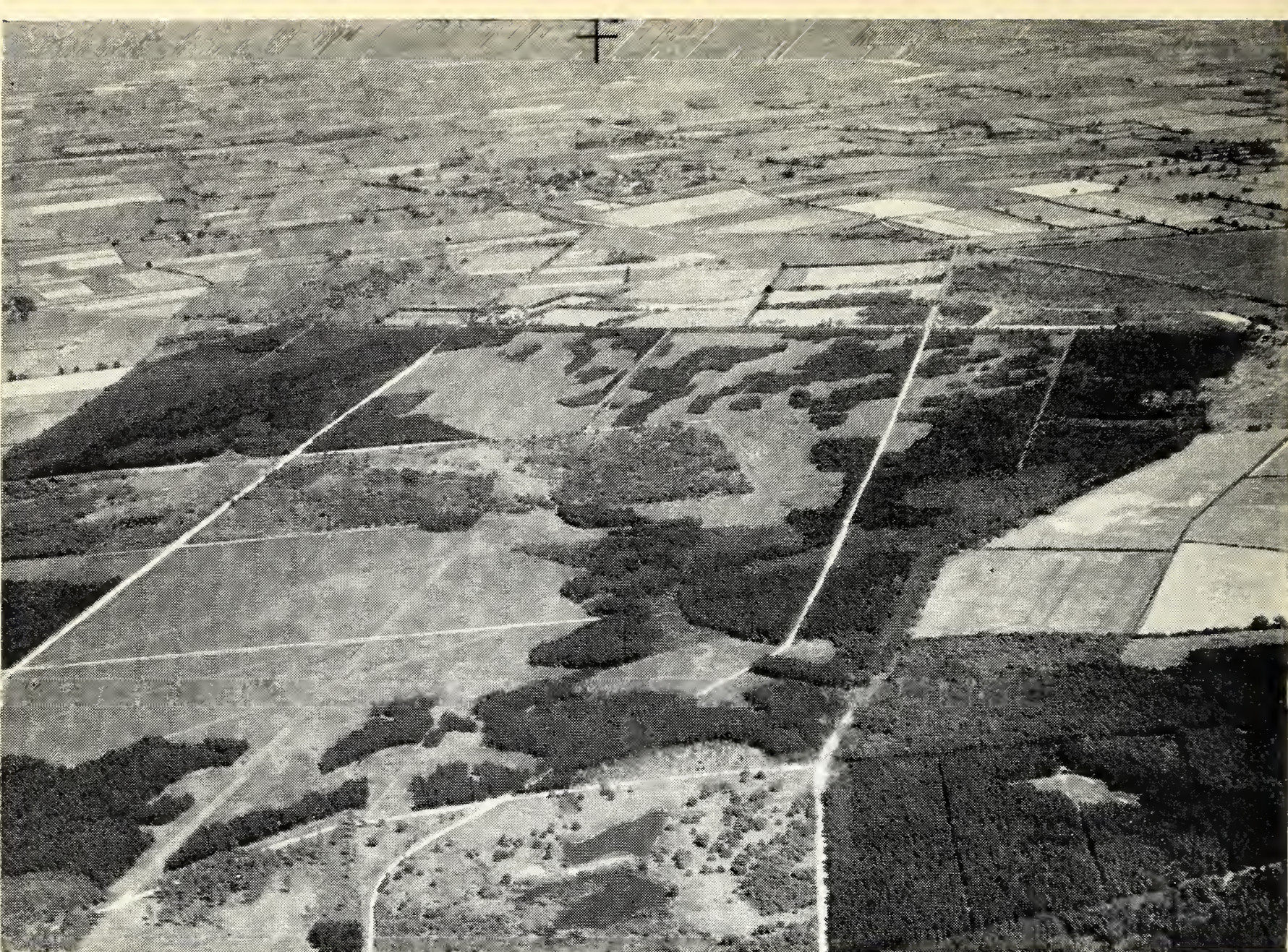
Animals are also affected by the diminution of permanent grass especially when it is accompanied — as it often is — by destruction of hedgerows. Cornwallis showed in his masterly series of papers on farming and wildlife that most of the birds and other animals we think of as common farmland species are in fact creatures of hedgerows and of pastures. The modern arable field is a poor habitat lacking cover, breeding sites and song posts, and in these days of weed and insect killers provides a much diminished food supply. Even for the few ground nesting species like the Lapwing, which have adapted themselves to ploughland, disturbance and damage from machinery reduces nesting success. Old pastures on the other hand provide an abundant supply of food for many field birds and it is particularly noticeable now in predominantly arable areas how the few remaining pastures attract large numbers of wintering thrushes, gulls, Rooks and other species. The ploughing of old grasslands with their abundant ant colonies is almost certainly one of the causes of the decrease of the Green Woodpecker in Lincolnshire in the last ten years.

The Trust has acquired two important neutral grassland areas in the last two years, both in the south of the county. Baston Fen consists of some 90 acres of rough, wet grassland and flooded borrow pits adjoining the river Glen for which it serves as a flood reservoir. The grassland, which is grazed in summer, is rich in species — including marsh orchids — and provides a nesting and feeding area for Redshanks, Lapwings and other waders, and for wildfowl. The other reserve is Surfleet Lows, a marshy pasture of about 7 acres, which is also subject to winter flooding. The varied flora of this site includes many grasses, sedges and rushes. The Hairy Buttercup, which occurs there, is a localised, mainly sub-maritime, species in England. It is of course essential to maintain optimum grazing regimes in both these areas.

The Trust aims to secure a few more reasonable sized samples of neutral grassland to retain under a mowing and/or grazing regime, but the high values in Lincolnshire of even mediocre agricultural land put out of the question the conservation of any extensive areas of this dwindling habitat. A few years ago we perhaps assumed in selecting road verges for special treatment as examples of old grassland that those on the chalk and limestone were more important and more in need of protection than those on clay soils. That assumption needs to be re-examined.



*Sedge Warbler which breeds in both the Gibraltar Point and Saltfleetby-Theddlethorpe Nature Reserves.
(Photo by T. J. Winnall, C.B.E.).*



An aerial photograph of Scotton Common. The greater part of this, the most extensive tract of heathland in north-west Lincolnshire, has been afforested during the last forty years. Coniferous plantations of various ages and areas cleared for planting are conspicuous features of the photograph. Near the south-east corner of the Common is the Trust's nature reserve, an area of about 35 acres consisting of birch and pine woodland and grass and heather heath with marshy patches. (Crown Copyright Reserved).



Ringed Plover at nest, Gibraltar Point. (Photo by Harold Auger).



Bog Asphodel. The Scotton Common reserve now seems to be the only locality in Lincolnshire where this beautiful flower still grows. (Photo by R. H. Hall, F.L.S.).



Heron and young at nest in a Lincolnshire Heronry. (Photo by Harold Auger).

Grasslands on Chalk and Limestone

The effect of modern agriculture on the calcareous grasslands of Lincolnshire has been less drastic simply because the 18th and early 19th century ploughing and enclosure of the Wolds and the Lincoln Heath had already eliminated all but a few fragments of the downland. The conversion to arable of these enormous grasslands — intensively sheep and rabbit grazed for six centuries — was remarkably rapid and complete. When he came to Lincolnshire in 1799 to make his report for the Board of Agriculture Arthur Young saw great changes in the Wolds since his previous visit 30 years earlier, but even so there were still extensive tracts of open sheep-walks and rabbit warrens. Yet by 1830 the transformation was complete. William Cobbett in that year saw only “a very fine corn country” with fenced fields, “the hills not downs as in Wiltshire, but cultivated all over”. And J. A. Clarke writing in the *Journal of the Royal Agricultural Society* in 1851 remarked that “no portion of the ground has been allowed to remain (as on the Downs of southern England) a tract of sheep-walks in its primitive vegetation of heath and fern, but the highest parts are all in tillage and the whole length of the Wolds is intersected by neat whitethorn hedges, the solitary furze bush appearing only where a roadside or plantation offers an uncultivated space”.

It was men like Tennyson's Northern Farmer whose energy and thoroughness — which has striking modern parallels — effected these improvements. The old man on his death-bed proudly remembers his achievements, especially the cultivation of Thorganby Warren:

“Dubbut looäk at the waäste: theer warn't not feäd for a cow;
Nowt at all but bracken an' fuzz, an' looäk at it now —
Warn't worth nowt a haäcre, an' now theer's lots o' feäd
Fourscore yows upon it an' some on it doon in seäd.

Nobbut a bit on it's left, an' I meän'd to 'a stubb'd it at fall,
Done it ta-year I meän'd, an' runn'd plow thruff it an' all,
If godamoighty an' parson 'ud nobbut let ma aloän,
Meä, wi' haäte oonderd haäcre o' Squoire's, and lond o' my oän.”

It was the same story on the limestone Heath. There even by 1800 progress in reclamation had been so rapid in twenty years that Young found little remaining to be done.

And apart probably from smaller and rather fewer hedges, I suppose that much of the chalk Wolds and the Heath have not changed much in appearance since that time, except in the north Wolds where the Yarboroughs' great plantations have introduced a new visual element and a new habitat to the chalk hills.

So for 150 years and more, the chalk and limestone flora of Lincolnshire has been confined to hillsides too steep to plough, to road verges and to disused quarries. There is in fact a good deal of escarpment grassland in the Wolds and on the Cliff, but much of it has been long ungrazed and is in any case rather thickly covered by clay eroded from the plateau above. In consequence these slopes are usually dominated by the coarser calcicolous grasses like Tor Grass and Upright Brome. Nevertheless, grazing of some of them, if it could be arranged, might well produce a more varied flora. Some are known to retain colonies of grassland butterflies, like the Common Blue, which have become generally much scarcer in recent years. They would repay more systematic survey. There are also areas of well grazed grassland on valley slopes — more perhaps than we had suspected before the more thorough surveys of the last 15 years. The recently revised S.S.S.I. (Sites of Special Scientific Interest) lists

for Lindsey and Kesteven contain seven such sites and there may still be a few more awaiting discovery. Of these the Trust owns or has protective agreements over the Red Hill at Goulceby, the Ancaster Valley — described by one eminent botanist as the most important limestone grassland on the oolite north of the Cotswolds — and Holywell Mound, an extraordinarily rich fragment which is also of much more than local importance.

These grasslands retain their richness and variety of flora as long as they are grazed. If grazing ceases or is too light they are quickly invaded by scrub of thorn or gorse or dominated by grasses. These problems of management are already apparent at the Red Hill and the Ancaster Valley. They apply equally to the road verge reserves on the chalk and limestone established under the agreement between Lindsey and Kesteven County Councils and the Trust and the Nature Conservancy. Nineteen out of 24 of these in the two counties are calcareous grasslands. Here grazing — even if practised in the past — is no longer possible and mowing is the only practicable method of vegetation control. We need to know much more about the effects of mowing — and grazing — at different times and intensities. Fortunately this is the subject of much research and experiment at the present time.

The habitat conditions and plant communities of disused quarries are of course different from those of undisturbed grassland, but they often contain a surprising variety of calcicole plants and associated animals, and cliff and scree conditions not normally found elsewhere. They often show too in a small compass all the stages in succession from bare ground through grassland to scrub and woodland. They provide important refuges for birds, butterflies and other animals, so helping in retaining biological diversity in a countryside increasingly deprived of semi-natural vegetation. Protection and management of a representative sample of quarries in Lincolnshire is vitally important for conservation and for education. The Trust has made a start by acquiring the Claxby and Welton chalk pits and securing agreement to protect the Wilsford Heath quarry.

A different kind of disturbed habitat, mainly on calcareous soils, is found in the recently established reserve at South Rauceby which is on sands and gravels carried through the Ancaster Gap by glacial melt waters and deposited over the dip slope of the limestone. Of the heath and warrens which must have covered much of this district only a few patches of old turf now remain, some of them in the reserve. Ecologically these have affinities with the Breckland, and the varied flora of the reserve includes a species, the Smooth Rupturewort, which is scarcely known elsewhere outside the Brecks. Most of the area has been disturbed by sand and gravel excavation, but the disturbed areas, including the flooded pits, are themselves of great interest.

I must not give the impression that the remaining chalk and limestone habitats of Lincolnshire have remained unscathed by the developments of recent years or are not threatened by them. There is good evidence that several of the more exacting calcicole plants — orchids like Fragrant, Frog, Dwarf and Bee — have decreased. Many hillsides formerly too steep to plough can now be converted to arable or re-seeded to grass by modern machinery and chemical methods. There has certainly been a further shrinkage of permanent grassland on calcareous as well as neutral soils and even some disused quarries have been levelled and ploughed. At least one of these losses was a major disaster. I refer, of course, to Waddingham Common, a unique example in Lincolnshire of a turf bog on limestone with a mixture of calcicole and calcifuge plants. The history of that lamentable affair has been well documented and is not forgotten, but it is a fact that even now statutory Sites of Special Scientific Interest enjoy

no significantly greater measure of protection than they did then. The tragedy of Waddingham Common could still be repeated.

Road verges too have been reduced by road widening and extensively changed and disturbed by levelling and excavation and by destruction of adjoining hedges. Fortunately, except in a very few instances they have not suffered the wholesale chemical spraying onslaught which at one time seemed possible. The scheduling of road verge nature reserves by Lindsey and Kesteven County Councils was an enlightened act which has proved to be a prelude to a wider national consideration of the use and management of verges. The decline of roadside butterflies may be due to a variety of causes — sensitivity to agricultural chemicals has been suggested — but I feel sure that deterioration of habitat is one of them. The reduction in width, increased disturbance, uprooting of adjoining hedges and the effects of motor traffic including possible pollution must all make verges, especially those of busy roads, less favourable for plants and animals than it was thirty years ago. We must consider it particularly fortunate that the only colony of Chalkhill Blue butterflies in Lincolnshire survives in one of our Kesteven road verge nature reserves.

Many disused quarries have reverted to scrub; some have been filled in; others have been used for refuse tipping both casual and controlled. More damaging even than metal refuse is agricultural waste — potatoes, potato haulm and straw — which has turned many an old quarry into a stinking, rat-infested morass. The Trust is undertaking a ponds, pits and quarries survey to determine which are of the greatest biological interest with a view to seeking the co-operation of owners and local authorities in protecting them, whilst also indicating those which can be used for refuse tipping without loss of amenity or scientific value.

Heathlands

Let us look now at the acid grasslands and heaths of the sand and gravel areas of the county. These heathlands survived much longer than those of the chalk and limestone hills. Indeed it is only in the last 50 years that they have really disappeared. Some of those near Scunthorpe like Crosby Warren were destroyed in the early days of ironstone mining in the late 19th and early 20th century, but in the main the heaths have more recently been converted to coniferous forest or have been used for agriculture by means of new methods of cultivation and new cropping systems applicable to poor, acid soils. Most of Manton Common and Manton Warren, a great tract of low-lying and escarpment heathland, has been cultivated in the last 15 years. This was an area of considerable scientific interest which only just missed designation as a Conservation Area in 1948. Among its rare species were the Large Heath butterfly and the Woodlark, the latter now extinct in Lincolnshire. Part of the valuable remnant of heathland at nearby Messingham is now also being destroyed.

Until the first World War, Scotton Common was a vast tract of heathland, some of it low-lying and wet, some dry and sparsely covered with vegetation. It was an area particularly rich in wildlife. Until the latter part of the 19th century Stone Curlews and Dunlins nested there and Wheatear, Whinchat and Stonechat continued to do so until afforestation. The ponds and flashes attracted many wildfowl and water birds whilst Lapwings, Redshanks and Snipe were abundant. "In these days of drainage and reclamation of land", wrote the Rev. F. L. Blathwayt in the *Transactions* for 1906, "it is very refreshing to the naturalist to find here and there patches in an almost primeval state. Scotton Common is still one of these primitive spots". Linwood Warren at the south-western extremity of the cover sands was also more extensive, more

open and much wetter 100 years ago than it is now. Like many of the heathland areas it bears evidence of long and varied use by man. On the Trust's Linwood Warren reserve there are prehistoric implements, Romano-British pottery kilns, ancient boundary banks indicating a field system, rifle range butts used by the Market Rasen volunteers in the 1870s and trenches dug for practice by soldiers in the first World War. Trees have been planted and felled; parts of the area have been ploughed and cropped; other parts grazed by cattle or sheep. And the result of all this human use is a mosaic of heath and woodland habitats which give the reserve a rich and varied flora and fauna and, incidentally, present the Trust with a complex but fascinating management problem.

Because they survived so long and because the land remained of relatively low value, the Trust has been able to acquire the fairly considerable remnants of Scotton Common (40 acres) and Linwood Warren (66 acres) and smaller patches of woodland and heath at Langholme and Birds Woods in Axholme. Scotton is a good sample of the low-lying areas of the former Common and retains many of its typical plant communities and species, although some like the Long-leaved Sundew and the Lesser Clubmoss now seem to be extinct. Linwood too has had its losses — Marsh Gentian, for example — but it also has a rich flora and fauna which includes Sundews, a rare lichen, the Iceland Moss, Nightjar, Slow-worm, Water Shrew, Red Squirrels and many scarce or localised species of moths and other insects. The main problems of management at both reserves are the control of vegetation and the maintenance of an adequate water table in the wet habitats. Birch and Scots Pine spread so rapidly that the heather areas have to be cleared of them every few years.

The reduction of the rabbit population since myxamotosis has undoubtedly aggravated the problem of vegetation control; in the absence of grazing the Heather itself becomes leggy and eventually moribund. The disappearance of the Grayling butterfly from the Scotton reserve and the Marsh Gentian from Linwood can probably be attributed to the ranker growth of grass and heather. At Linwood the experimental grazing of the grassland at the west end of the reserve by cattle and horses offers hope of reducing the rushes and Tufted Hair grass and restoring a more varied flora. To maintain water tables the stream at Linwood has been used to feed an ingenious irrigation system, but at Scotton a similar gravity system is not practicable.

The Trust's latest reserve at Kirkby Moor is a fine example of heathland on podsolised soils of fen-edge sands and gravels deposited in the last glaciation. This too consists of a mosaic of habitats including some intensively rabbit-grazed and others dominated by heather and by bracken. In addition, there are boggy areas and some woodland with Alder Buckthorn adjoining the large shallow reservoir which now resembles a natural pool. This is the largest remaining tract of the once extensive heaths of the Woodhall district which are now largely cultivated, afforested or built over. Like Linwood it has a richly varied flora and fauna with such rare species in Lincolnshire as the Dark Green Fritillary butterfly and the Broad-bordered Bee Hawk moth. Its ecology, however, differs appreciably from that of the north-west heaths and it adds an important new element to the Trust's now impressive series of heathland reserves. These include some of the wildest inland areas left in the county and should help us to retain a wide range of scarce and localised species.

Fens, Marshes and Wetlands

Two hundred years ago much of south-east Lincolnshire was still undrained or only partially drained fenland. The most extensive area — the East Fen —

remained "in a state of nature," as Gough described it, until after 1800. "A vast tract of morass", he called it, "a specimen of what the country was before the introduction of drainage". From the porch of West Keal church high above the Fen you could have looked out in 1806 over the meres, the vast reed-beds, the tussocky pastures, and on the higher ground towards the east the tracts of moorland and woodland of Pine-Oak-Birch. Ten years later all this had gone and in its place were the ditch-bounded fields of the present-day, only then they were probably mainly pasture rather than corn and potato lands. Gone too were the vast flocks of wildfowl — the ten decoys in the Fen had sent more than 30,000 ducks a year to the London markets — the Bitterns and Bearded Tits, the Ruffs, Black-tailed Godwits and harriers and perhaps the Swallowtail and Large Copper butterflies. So thorough was the fen drainage of south Lincolnshire that not a vestige of the great wetlands remained.

In the Isle of Axholme drainage of the fenland was almost equally complete, but a few remnants survived there in the form of turbaries, peat bog areas — possibly the sites of former meres — allotted at Enclosure for turf digging to the inhabitants of the parishes. Epworth, Haxey, Belton and Owston all had their turbaries, but only Epworth Big Turbary and part of Haxey have escaped drainage and reclamation and are now owned by the Trust.

Both these remaining turbaries have been extensively dug for peat and their raised bog structures largely destroyed. Nevertheless they retain — especially Epworth which is much the larger — a range of fen and wet heath conditions including areas of sphagnum bog, reed swamp and mixed fen vegetation in which occurs the Sedge, *Cladium mariscus*, once abundant in the southern fens and now confined in Lincolnshire virtually to these two reserves. Any fen relicts in lowland Britain are of more than local importance and the interest of these Axholme turbaries is enhanced by the northern elements in their flora and fauna, exemplified by the Bog Rosemary, and the Large Heath butterfly both found here at the south-eastern limit of their range in Britain.

Any remnant of fen or marsh or wet heath which survives in intensively cultivated countryside like ours will inevitably suffer from the general lowering of the water table which results from the more efficient drainage of the surrounding land. The turbaries are no exception and at Epworth a new drainage scheme poses particular problems. One result of drying out can readily be seen in the spread of Birch scrub which will need to be controlled as soon as resources are available.

Some fenland and wetland plants and animals have of course survived in more recently man-made habitats. The ornamental lakes of the 18th century parks, the field ponds required by the mixed farming systems of the 18th and 19th centuries, the new dykes of the reclaimed fens and marshes, the hundreds of claypits which resulted from the local brickmaking industry in the 19th century were all important in this connection. It is surprising how few of the East Fen plants listed by Peacock in 1915 have become completely extinct in the county, although some like the Water Soldier survive in only one or two places. Pilcher, in *Transactions* for 1960 showed that some of the fen species of moths — some of the Wainscots, for example — survive here and there in the reed-beds of disused brickpits. The same is no doubt true of other invertebrate animals and, although we have lost birds which require large reed-beds and tracts of marsh, others like the Reed Warbler which can adapt themselves to smaller areas are still present wherever suitable habitats occur. And significantly the most extensive areas of reed bed in the county in the Humber Bank clay pits have attracted the Bittern to return to breed.

The 20th century need for sand and gravel is creating many new areas of water and marginal vegetation. The Little Ringed Plover has become a

county breeding species entirely as a result of the creation of gravel pit habitats, and the 1966 census of Great Crested Grebes revealed that the majority of the 48 pairs were on flooded sand and gravel pits made since a previous census in 1931 when there were only 27 pairs in the county. Now there is a prospect of more open reservoirs in the county and the one at Covenham is already nearing completion. Experience elsewhere shows that these are usually attractive to wildfowl, although the very artificial nature of the conditions at Covenham seem unlikely to offer much more than a resting and roosting place.

Man-made wetland habitats have certainly provided some compensation for the loss of fenland and marsh, but we cannot afford to be complacent about the present situation. Field ponds, now redundant, are rapidly being eliminated; even some of the larger brick pits are being filled in with refuse. The recreational demand for water for sailing and other water sports and for fishing has increased phenomenally, and, whilst some of these pursuits are not necessarily incompatible with wild life, the claims of conservation need to be strongly urged. Increasingly, I think planning authorities will suggest the allocation of waters for different purposes. I hope the Covenham reservoir will demonstrate the possibilities of multi-purpose use on a site where seasonal arrangement of activities is possible.

Aquatic habitats are not well represented in the Trust's series of reserves. In view of the demand and the consequent high costs of many areas of water this is perhaps not surprising, but it is a deficiency which must be remedied whenever opportunities present themselves. The five Sea Bank clay pits made in 1947 and 1953 have proved to be most valuable nature reserves and they are still improving. The old reservoir at Kirkby Moor and the flooded gravel pits at Rauceby provide different types of aquatic habitat. Otherwise there are only small ponds on a few other reserves — the Gosberton pits, for example, and the Friskney Decoy Wood pond. The small reed marsh and blow wells recently given to the Trust at Barrow-on-Humber have a special physiological and ecological interest. Some larger reed-bed areas and one or more large gravel pits ought to be in the reserve series, and, as more local groups and resources become available to manage them, a well distributed, representative sample of clay pits and ponds — of educational as well as conservation value — ought to be acquired.

Like its lakes and ponds most of Lincolnshire's rivers are small — little more than streams most of them. They have nevertheless in an intensively cultivated countryside a high amenity and biological value which is only now being systematically investigated. Modern drainage and improvement deal harshly with them. Natural meanders are eliminated, banks are uniformly sloped and trees removed. Variety of aquatic and riparian habitat is seriously reduced. Scarcity of nesting sites and fishing perches may be one of the causes for the disappearance of the Kingfisher on some of our streams. The inevitable result of improved drainage is the conversion to arable of many riverside pastures. The sites where Marsh Orchids and commoner marsh plants grow and where Snipe nest become steadily fewer. A few riverside marshes should find a place among our reserves, but we must expect the loss of the majority. Fortunately, the River Authority has expressed its willingness to consult the Trust about the treatment of upland streams and with the help of the Nature Conservancy a schedule of the most important stretches is being prepared.

Coastlands

About the coastlands of Lincolnshire I intend to say little because their physiological and ecological importance and the recent history of their conservation has been more fully described than for any other set of habitats.

There are, I suspect few people who remember or realise how nearly our two splendid coastal reserves escaped destruction in the 1920s and 1930s. At both of them development which would have turned them into shack towns had already begun when circumstances enabled the provision of the Lindsey Sandhills Act of 1932 to be applied to save them. At Gibraltar Point the collapse of the Tennyson Glen estate scheme led to the purchase of the area by the County Council, and at Saltfleetby the requirements of national defence, in the form of practice bombing ranges were eventually allowed precedence over the County Council's intention to safeguard the dunes from development of a kind which was already under way before 1930. In the diary of the late Miss D. Marsden, a Louth naturalist, there are touching references to what seemed at the time to be the inevitable destruction of the Saltfleetby dunes and marsh.

1928 June 7th

"It is grievous to think that Rimac has been sold to a syndicate formed with a view to erecting a garden city, where now is a sanctuary for birds and flowers".

1928 July 17th

"I paid my last visit to Rimac before the building of the Garden City begins. Already teas and refreshments can be had at Rimac House. The Caretaker walks about with a hideous plan of the estate, all divided up into little bits — several have been sold and apparently the wild fowls' home on the marsh is to be made into a lake and a row of bungalows, in front of it facing the sea. Will any of our treasured plants survive?"

1929 August 13th

"Just to see if Rimac was quite improved out of existence. It was not, though its peaceful freedom has gone, 6 or 7 huts and bungalows of varying degrees of ugliness. However I was not hindered from walking across where the marsh and sandy pools used to be — quite dry this year and depressions where Marsh Pennywort and rushes grew already being filled up with broken pots and tins, etc. I saw very few birds, but the flowers are to be found still."

Fortunately it was staved off at Saltfleetby, but further north at Humberston an area of dunes and saltmarshes noted for its wildlife was ruined by haphazard development. The enormous demands upon our coastline for holiday-making purposes — which need no elaboration — and the consequently high development value of land for building and for caravan and chalet camps has made the conservation of the two nature reserve areas at once the most important and the most exacting task which the Trust has undertaken. For the first 15 years of its existence the major part of its resources went into the protection and management of these coastal reserves, including major participation in the series of caravan camp enquiries at Gibraltar Point in 1953 and Theddlethorpe and Saltfleetby in 1959 and 1962. There is no doubt that concentration on the coastline delayed development elsewhere, but in view of the scientific importance — national as well as local — the educational values and the extreme vulnerability of the coastal reserves, I am sure this policy was right. Moreover, it provided the essential foundation for the later expansion of the Trust's work throughout the county.

Of course, the Trust alone could have done little or nothing to protect Gibraltar Point or Saltfleetby-Theddlethorpe. The debt which all who value these unspoilt coastlands owe to the far-sighted policies of Lindsey County Council from their unique Sandhills Act of 1932 to the present day cannot be too often acknowledged.

Most of the Saltfleetby-Theddlethorpe reserve has now become a National Nature Reserve owned by the Nature Conservancy and jointly managed by

the Conservancy and the Trust which retains a lease of part of it. Gibraltar Point — Skegness, the first statutory local authority reserve in England, has earned through its splendid field station and long established bird observatory a national reputation for research and for education in field studies. It has provided a model of co-operation between a County Trust and local authorities who own it, Lindsey County Council and Skegness Urban District Council; and it has been looked to as a reserve where management has been specially designed to reconcile large-scale public access with conservation, a problem of fundamental importance for many reserves and areas of natural interest and beauty in Britain.

Both the reserves have features of outstanding physiographical and geomorphological interest; they contain a wide range of maritime habitats and a wealth of plants and animals including several rare coastal species which occur nowhere else in the county. Outstanding ecologically are the succession of dune vegetation at Gibraltar Point including the best developed Sea Buckthorn scrub in Britain, and the freshwater marsh at Saltfleetby, a kind of maritime fen unique on the east coast of England. For birds Gibraltar Point is of particular importance, providing a refuge for a great variety of breeding, migrant and wintering species in vast numbers.

Conservation Management

In this country — especially in a county like ours — wild plants and animals are closely and constantly affected for better or for worse by the ways in which man uses the land. This is obvious enough on farmland, but it applies also to the remnants of wild places because, as pressures on land use multiply, these are subject to increasing erosion, and even when protected, are too small to be immune from what happens around them — the lowering of water tables by drainage, the felling of woods, contamination by toxic chemicals and other forms of environmental pollution.

Management of reserves has to be designed therefore not only to maintain particular habitat conditions, but to counteract as far as possible harmful external factors. It may also be necessary to restore habitats which have deteriorated or disappeared in the hope of attracting lost species or in exceptional cases and with meticulous preparations, re-introducing them. Maintenance of habitats often means arresting the vegetation succession at a particular seral stage. Sometimes this involves finding an effective substitute for grazing animals; sometimes it means the continuation of a near obsolete agricultural or silvicultural practice — which is really what we are doing when we cut coppice in Hoplands Wood or what we shall no doubt one day be doing when we mow a meadow in the old fashioned way. We may even wish to farm a field badly by modern standards to conserve communities of corn-field weeds.

We can apply these systems of management to our reserves and other natural areas like road verges, but if wildlife in any variety is to survive on our farmlands there will have to be deliberate development of habitats within them. Such variety was a by-product of the older farming methods; new ones are not conducive to it. But many writers have suggested that even on the most intensively cultivated farms there is still room for wildlife habitats — not every hedge or tree needs to be destroyed, there is much scope for new planting, and there are places which for one reason or another cannot be brought into cultivation. This, as you know was the theme of so many of Dick Cornwallis' articles and speeches which have done so much to encourage new attitudes towards landscape and wildlife among the farming community. I would like to quote the concluding sentences from an article of his published posthumously in the journal *Biological Conservation*.

“The rotational farming systems of the last two centuries produced a landscape pattern that was rich in variety and supported a rich and varied wildlife. This pattern is changing. But if farmers can come to realise that they, just like their forefathers before them, carry a responsibility to future generations for the kind of countryside they will have to live in, much can be done to develop a new landscape that will be compatible with, and expressive of, modern scientific mechanised farming — yet will be pleasing to look at and still rich in wildlife.”

Conclusion

I have looked at the main semi-natural habitats of our county and the landscapes of which they form a part, and at the ways in which they have been and are being modified by human activity. I have described in this context the achievements and the aims of the Lincolnshire Trust in conserving samples of these habitats. There are about 2,300 acres in nearly thirty reserves of which I calculate at least 10 would by now have been totally destroyed or irreparably damaged had we not protected them.

The term nature reserve has acquired a broader significance — we have new concepts both of management and use. Management must be applied ecology and each reserve must serve one or more purposes appropriate to its nature and size. It may be primarily sanctuary or living museum or outdoor laboratory. Often reserves have become reservoirs of more specialised plants and animals from which recolonisation of surrounding areas can take place if and when favourable conditions again become more widespread. They are also the places where the techniques of management of wild lands and plant and animal communities can be tested and demonstrated. And, of course, a few like Gibraltar Point can fulfil almost all of these purposes including that of conveying to the ordinary visitor a better appreciation and understanding of nature and of man's place in it. Whatever the use, however, its compatibility with conservation must be of primary concern. For this reason we need more reserves both as habitat samples to help conserve biological variety throughout the countryside and to meet the growing demands for outdoor education and for enjoyment of nature.

Clearly the Trust's work in conservation — of which nature reserves are only one aspect — has only just begun. The pressures on the environment which result from population growth and technological innovation gather momentum and are increasingly apparent in our county as Humberside industries expand, as proposals for damming the Wash for all manner of purposes are discussed, and as farming methods and consequently the landscape are transformed.

We can take some pride that naturalists in this county have been in the forefront of this movement to conserve variety and beauty of nature and the countryside and that the county in turn has given such a notable example to others in many aspects of conservation. More and more people are concerned about the future of our natural environment and anxious to do something about it. Some are naturalists, some scientists and teachers, others are interested in countryside pursuits, the majority are simply lovers of nature. There are many concerns and motives, but I am content to leave the last word with the poet:

What would the world be, once bereft
Of wet and of wildness? Let them be left,
O let them be left, wildness and wet;
Long live the weeds and the wilderness yet.

For your information:

details of membership (Ordinary 25/- per annum) of the
LINCOLNSHIRE NATURALISTS' UNION

available from the

Hon. General Secretary, c/o. City and County Museum, Lincoln.

details of membership (Ordinary £1 per annum) of the
LINCOLNSHIRE TRUST FOR NATURE CONSERVATION LTD.

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Administrative Officer, Old Manor House, Alford, Lincs.



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Newly emerged Chalkhill Blue butterflies. This handsome insect occurs only in one of the Kesteven road verge nature reserves, its most northerly station in Britain. (Photo by G. E. Hyde).

